



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>F01N 3/28</b>	<b>A1</b>	(11) International Publication Number: <b>WO 99/27240</b> (43) International Publication Date: 3 June 1999 (03.06.99)
---	-----------	--

(21) International Application Number: PCT/SE98/02019

(22) International Filing Date: 10 November 1998 (10.11.98)

(30) Priority Data:  
9704265-9 21 November 1997 (21.11.97) SE(71) Applicant (for all designated States except US): NILCON  
ENGINEERING AB [SE/SE]; Bangårdsvägen 25, S-428 36  
Källered (SE).

(72) Inventor; and

(75) Inventor/Applicant (for US only): NILSSON, Sven, Melker  
[SE/SE]; Småkullevägen 18, S-428 35 Källered (SE).(74) Agent: TÅQUIST, Lennart; Sandvik Aktiebolag, Patent Dept.,  
S-811 81 Sandviken (SE).(81) Designated States: JP, KR, US, European patent (AT, BE, CH,  
CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL,  
PT, SE).

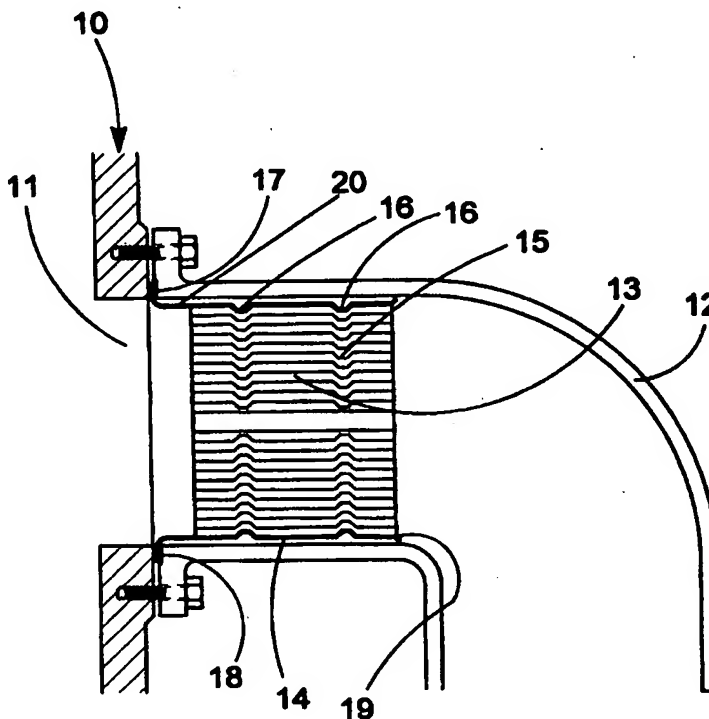
Published

With international search report.

(54) Title: CATALYTIC CONVERTER AND METHOD FOR MOUNTING OF CONVERTER

## (57) Abstract

Catalytic converter for treatment of exhaust gas from combustion engines, comprising a metal monolith (13) held together by interlocking ridges (15) between spirally wound layers without brâzes or welds, with a mantle (14) held to the monolith by the same type of interlocking ridges (16), and where the mantle has an integral clamping flange (17) which is clamped between the exhaust manifold (12) and an exhaust port (11) of the engine block (10).



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

CATALYTIC CONVERTER AND METHOD FOR MOUNTING OF CONVERTERBackground

5

It is generally accepted that one way to ensure that catalytic converters for internal combustion engines fulfil the requirements for rapidly becoming active after starting the engine, is to provide a first converter close to the engine manifold, where the exhaust gas from the beginning has a high enough temperature to effect a light-off of the converter, and a second converter further down along the exhaust pipe where temperature and vibration are less demanding. Such divided converter systems are described in patents US 5,444,978, EP 629 771, EP 761 939, and DE 44 42456. The extreme oscillations of pressure and temperature, as well as the high peak temperature make it difficult to get sufficient lifetime of the first manifold converter, and many suggested designs include means for easy replacement, or for bypassing it as soon as the second, main converter is operative, as shown in DE 44 42456.

10

15

20

The present invention is a new type of manifold converter and a way to mount it close to the engine, where the converter is less vulnerable to heat fluctuation and vibration, and where a rapid light-off is assured.

Description

25

The converter and its mounting is described with reference to the figures, where figure 1 shows the configuration of the engine system, figure 2 a section through part of the engine and manifold with the manifold converter.

30

Catalytic converters usually comprise a monolith body with numerous parallel channels, the inner surfaces of which are coated with active catalyst layers. The monolith is commonly either an extruded ceramic body or a multiple of smooth and corrugated metal foils joined by brazing or welding. Ceramic bodies are brittle, however, and have to be elaborately mounted with resilient padding. Brazed or welded metallic monoliths develop

**CONFIRMATION  
COPY**

large thermal stresses, and at their elevated temperatures there is a great risk of failure of welds or brazes.

The invention will now be described more in detail by reference to the enclosed drawing  
5 which illustrates a preferred embodiment of the invention.

Fig. 1 is a side view of a device according to the invention.

Fig. 2 is a cross section of the device shown in Fig. 1.

10

According to the invention, catalytic converters with a metal monolith (13) are mounted between the engine exhaust ports (11) in the engine block (10) and the manifold (12), one converter per cylinder. Compared to designs with one converter per manifold, this leads to a lower average temperature and less risk of creep failure of the metal, but a wider  
15 temperature range. The monolith (13) and its mantle (14) can then be made of thinner metal than would otherwise be possible.

To reduce the thermal stresses in radial and tangential directions, the monolith (13) is made without brazes or welds, and the layers held together mechanically by tangential  
20 inward ridges (15) of smooth metal foils interlocking with notches in the corrugations of the corrugated metal foils, as described in patent SE 461 018. Variations in thermal expansion will then be accepted as radial play or as slight rotation of the inner parts relative to the outer parts. The ridges (15) of this design also have the added advantage of equalizing the turbulence in the axial direction, to make the whole length of the converter  
25 equally active, reduce the longitudinal thermal stresses and allow a comparatively short converter.

The converter is located at the exhaust port (11) of the engine, where the variations in exhaust gas velocity are greatest, which also ensures sufficient turbulence and lets the  
30 ignition point for the catalytic reaction fluctuate somewhat to avoid overheated spots.

One major advantage with the mechanical interlocking, as compared with brazing or welding, is that the mantle (14) around the monolith layers can be made much thinner than with other designs and interlock with the layers through the same type of tangential inward ridges (16). In previous designs, the mantle is so heavy and the monolith so long, that it has to be suspended at both ends, but according to the invention, it is sufficient to provide the thin mantle with a flange (17) behind or in front of the monolith (13). The thickness of the mantle is preferably in the range from 0.1 to 0.5 mm, and the length of the monolith from 25 to 50 mm. The mantle and the flange are preferably made from one integral piece of material by deep drawing or swaging.

10

The flange is clamped between the engine block (10) and the manifold (12). No bolt holes are needed in the flange (17). The mantle should not touch the inside of the manifold, but have a distance of a few millimeters, which should be open, without any insulating mat. To keep the converter centered in the manifold, a shallow recess (18) can be made in either the manifold or the engine block, or the neck (20) of the mantle between the flange and the monolith be made with locally raised areas. It can also be advantageous to extend the mantle past the monolith as a very narrow flange (19) which does not normally carry any load, but serves to guide the converter during the mounting operation to avoid scratching the mantle (14).

20

In the figures and the description, the converters have been described as extending into the manifold (12), which is a preferred embodiment with best mechanical stability, but for engine blocks of certain types or especially tightly bent manifolds, it is also possible to turn it with the monolith extending into exhaust port (11) of the engine block.

25

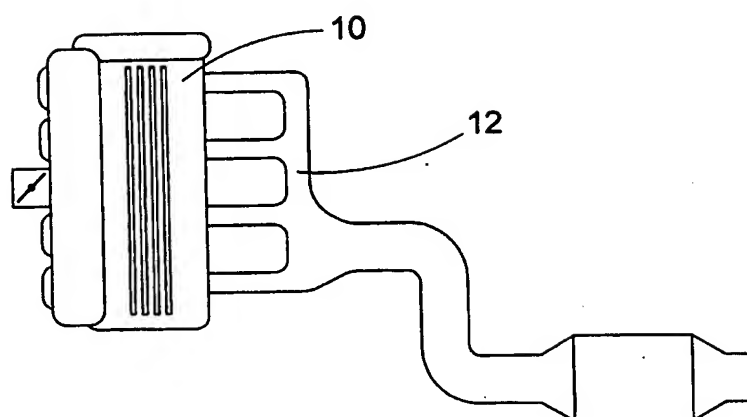
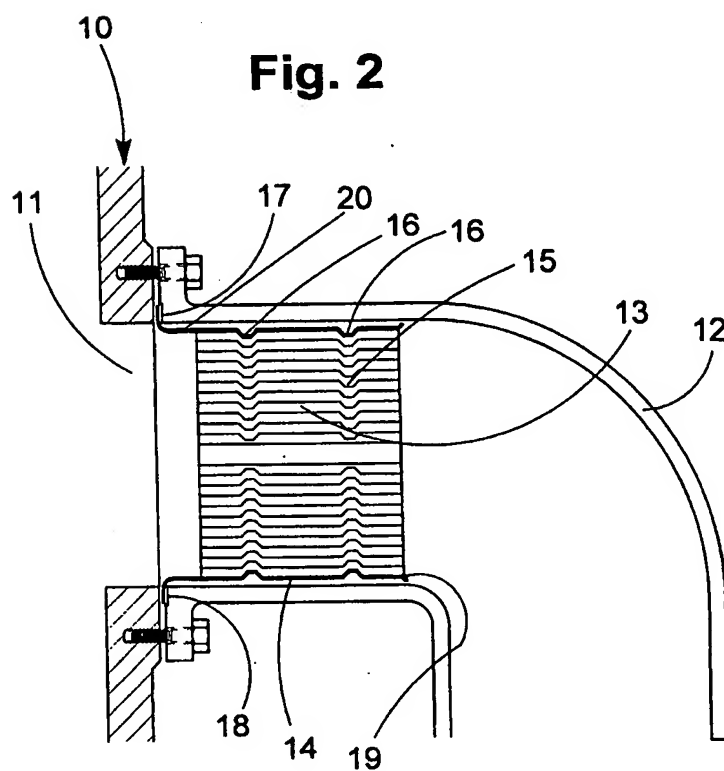
Catalytic converters made and mounted according to the invention can also be fitted to existing engines with little extra effort, compared to prior types which require redesigned or duplicated manifolds.

Claims

1. Catalytic converter for treatment of exhaust gas from combustion engines,  
comprising a metallic mantle (14) and a metallic monolith (13) spirally wound from one  
5 or more metal foils, held together and held to the mantle by interlocking tangential ridges  
(15,16) without brazing, characterized by the mantle having one clamping  
flange (17) for clamping between parts of the engine exhaust system.
2. Catalytic converter according to claim 1, characterized by the flange (17)  
10 and the mantle (14) being integrally formed from a single piece of material.
3. Catalytic converter according to claim 1, characterized by the flange (17)  
being located at one end of the mantle (14).
- 15 4. Catalytic converter according to claim 3, characterized by the monolith  
(13) being located entirely on one side of the flange (17).
5. Catalytic converter according to claim 3, characterized by having a small  
guidance flange (19) at the end opposite to the clamping flange (17).  
20
6. Method of mounting a catalytic converter in the exhaust system of a combustion  
engine, comprising the steps of
  - separating the exhaust manifold (12) from the engine block (10),
  - inserting between the manifold and the engine block a catalytic converter with a  
25 clamping flange (17) and a cylindrical monolith part (13), at least one converter for each  
engine cylinder,
  - centering the converter so that the mantle (14) of the cylindrical part does not touch the  
inside of the exhaust system,
  - replacing the exhaust manifold (12) and bolting it to the engine block (10), thereby  
30 clamping the flange (17) between the manifold and the engine block.

7. Method according to claim 6, where the cylindrical monolith part (13) of the converter extends into the manifold (12).

1/1

**Fig. 1****Fig. 2**



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/02019

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: F01N 3/28

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9634188 A1 (NILSSON, SVEN, MELKER), 31 October 1996 (31.10.96) --	1-7
A	EP 0761939 A1 (GENERAL MOTORS CORPORATION), 12 March 1997 (12.03.97) --	1-7
A	DE 4442456 A1 (BAYERISCHE MOTOREN WERKE AG), 30 May 1996 (30.05.96) -- -----	1-7

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

1 March 1999

Date of mailing of the international search report

12 -03- 1999

Name and mailing address of the ISA/  
Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. +46 8 666 02 86

Authorized officer

Marianne Bratsberg  
Telephone No. +46 8 782 25 00

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

02/02/99

International application No.

PCT/SE 98/02019

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	9634188	A1	31/10/96	AU	4360196 A	19/07/96
				AU	5412096 A	18/11/96
				CN	1182468 A	20/05/98
				EP	0840840 A	13/05/98
				SE	506670 C	26/01/98
				SE	9501556 A	28/10/96
-----						
EP	0761939	A1	12/03/97	NONE		
-----						
DE	4442456	A1	30/05/96	NONE		
-----						